

Fluorouracil (Adrucil®, 5-FU)

Pronounce: flure-oh-YOOR-a-sil

Classification: Antimetabolite

About Fluorouracil (Adrucil®, 5-FU)

An antimetabolite medication affects how DNA is made in cells. Cancer cells divide faster and with less error correction than healthy cells, making them more sensitive to these effects.

Fluorouracil changes how cancer cells make and use DNA and RNA. Fluorouracil prevents cancer cells from making important proteins, which causes cell death and can slow or stop cancer from growing.

How to Take Fluorouracil

Fluorouracil is given as an intravenous (IV, into a vein) infusion. How long the infusion takes depends on your treatment regimen. The dose will be determined by your care team. It can be given alone or with other medications.

If you take warfarin, your INR and PT levels will be closely monitored to adjust your warfarin dose as needed. Please make sure your healthcare team is aware of all the medicines you take before you begin treatment.

Possible Side Effects of Fluorouracil

There are a number of things you can do to manage the side effects of fluorouracil. Talk to your care team about these recommendations. They can help you decide what will work best for you. These are some of the most common or important side effects:

Low White Blood Cell Count (Leukopenia or Neutropenia)

White blood cells (WBC) are important for fighting infection. While receiving treatment, your [WBC count can drop](#), putting you at a higher risk of getting an infection. You should let your doctor or nurse know right away if you have a fever (temperature greater than 100.4°F or 38°C), sore throat or cold, shortness of breath, cough, burning with urination, or a sore that doesn't heal.

Tips to preventing infection:

- [Washing hands](#), both yours and your visitors, is the best way to prevent the spread of infection.
- Avoid large crowds and people who are sick (i.e.: those who have a cold, fever or cough or live with someone with these symptoms).
- When working in your yard, wear protective clothing including long pants and gloves.
- Do not handle pet waste.
- Keep all cuts or scratches clean.
- Shower or bathe daily and perform frequent [mouth care](#).
- Do not cut cuticles or ingrown nails. You may wear nail polish, but not fake nails.
- Ask your oncology care team before scheduling dental appointments or procedures.

- Ask your oncology care team before you, or someone you live with has any vaccinations.

Low Red Blood Cell Count (Anemia)

Your red blood cells are responsible for carrying oxygen to the tissues in your body. When the [red cell count is low](#), you may feel tired or weak. You should let your oncology care team know if you experience any shortness of breath, difficulty breathing, or pain in your chest. If the count gets too low, you may receive a blood transfusion.

Low Platelet Count (Thrombocytopenia)

Platelets help your blood clot, so when the [count is low](#) you are at a higher risk of bleeding. Let your oncology care team know if you have any excess bruising or bleeding, including nose bleeds, bleeding gums, or blood in your urine or stool. If the platelet count becomes too low, you may receive a transfusion of platelets.

- Do not use a razor (an electric razor is fine).
- Avoid contact sports and activities that can result in injury or bleeding.
- Do not take aspirin (salicylic acid), non-steroidal, anti-inflammatory medications (NSAIDs) such as Motrin/Advil (ibuprofen), Aleve (naproxen), Celebrex (celecoxib), etc. as these can all increase the risk of bleeding. Please consult with your healthcare team regarding the use of these agents and all over-the-counter medications/supplements while on therapy.
- Do not floss or use toothpicks and use a soft-bristle toothbrush to brush your teeth.

Diarrhea

Your oncology care team can recommend medications to relieve [diarrhea](#). Also, try eating [low-fiber](#), bland foods, such as white rice and boiled or baked chicken. Avoid raw fruits, vegetables, whole grain breads, cereals, and seeds. Soluble fiber is found in some foods and absorbs fluid, which can help relieve diarrhea. Foods high in soluble fiber include applesauce, bananas (ripe), canned fruit, orange sections, boiled potatoes, white rice, products made with white flour, oatmeal, cream of rice, cream of wheat, and farina. Drink 8-10 glasses of non-alcoholic, uncaffeinated fluid a day to prevent dehydration.

Mouth Ulcers (Mucositis)

Certain cancer treatments can cause [sores or soreness in your mouth](#) and/or throat. Notify your oncology care team if your mouth, tongue, inside of your cheek, or throat becomes white, ulcerated, or painful. Performing [regular mouth care](#) can help prevent or manage mouth sores. If mouth sores become painful, your doctor or nurse can recommend a pain reliever.

- Brush with a soft-bristle toothbrush or cotton swab twice a day.
- Avoid mouthwashes that contain alcohol. A baking soda and/or salt with warm water mouth rinse (2 level teaspoons of baking soda or 1 level teaspoon of salt in an eight-ounce glass of warm water) is recommended 4 times daily.
- If your mouth becomes dry, eat moist foods, drink plenty of fluids (6-8 glasses), and suck on sugarless hard candy.
- Avoid smoking and chewing tobacco, drinking alcoholic beverages and citrus juices.

Loss or Thinning of Scalp and Body Hair (Alopecia)

Your hair may become [thin, brittle, or may fall out](#). This typically begins two to three weeks after treatment starts. This hair loss can be all body hair, including pubic, underarm, legs/arms, eyelashes, and nose hairs. The use of scarves, wigs, hats, and hairpieces may help. Hair generally starts to regrow soon after treatment is completed. Remember your hair helps keep you warm in cold weather, so a hat is particularly important in cold weather or to protect you from the sun.

Nail and Skin Changes

Your [fingernails/toenails](#) may become dark, brittle, or fall off. Keep your fingernails and toenails clean and dry. You may use nail polish but do not wear fake nails (gels, acrylics, overlay). If any nails fall off, clean the nail bed well with soap and water and cover with a band-aid.

You may notice dry skin or changes in the color or tone of your skin. Your skin may be more sensitive to the sun, which can result in severe sunburn or rash. Sun sensitivity can last even after chemotherapy is completed. Avoid the sun between 10-2pm, when it is strongest. Wear sunscreen (at least SPF 30 with UVA/UVB protection) every day and reapply when in the sun for extended periods of time); wear sunglasses with UVA/UVB protection, a hat, and long sleeves/pants to protect your skin and seek out shade whenever possible.

Hand Foot Syndrome

[Hand-foot syndrome](#) (HFS) is a skin reaction that appears on the palms of the hands and/or the soles of the feet, as a result of certain chemotherapy agents being absorbed by the skin cells. HFS can begin as a mild tingling, numbness, pins-and-needles feeling, redness or pain, or swelling of the hands and/or feet. This can then progress to painful swelling, blistering, or peeling skin that can interfere with your ability to do normal activities. Be sure to let your oncology team know right away if you notice these symptoms, as they may need to adjust the chemotherapy dose or take a break to allow the skin to heal. Some tips to help prevent HFS include:

- Keep hands and feet clean and dry.
- Avoid tight shoes or socks.
- Avoid activities that put pressure on the palms or soles for 1 week after treatment.
- Apply an alcohol-free moisturizer liberally and often (Avoid moisturizers with perfumes or scents).
- Avoid very hot water for baths and showers.

Nausea and/or Vomiting

Talk to your oncology care team so they can prescribe medications to help you manage [nausea and vomiting](#). In addition, dietary changes may help. Avoid things that may worsen the symptoms, such as heavy or greasy/fatty, spicy or acidic foods (lemons, tomatoes, oranges). Try saltines, or ginger ale to lessen symptoms.

Call your oncology care team if you are unable to keep fluids down for more than 12 hours or if you feel lightheaded or dizzy at any time.

Important but Less Common Side Effects

- **Heart Problems:** In some cases, this medication can cause or worsen pre-existing heart problems including congestive heart failure, decreased heart function, and heart attack. Notify your healthcare provider if you have sudden weight gain or swelling in the ankles or legs. If you develop chest pain or pressure, pain in the left arm, back, or jaw, sweating, shortness of breath, clammy skin, nausea, dizziness, or lightheadedness, call 911 or go to the nearest emergency room.
- **Neurotoxicity:** This medication can cause neurological issues such as confusion, disorientation, ataxia (trouble walking), and visual disturbances. Call your provider immediately if you are having any symptoms of a neurological issue.
- **Elevated Ammonia Level:** This medication can cause the level of ammonia in your blood to become too high, which can then affect how your brain is functioning. You will have your labs checked to monitor your ammonia level. Symptoms include ataxia (trouble walking), intellectual impairment, and changes in behavior. Call your provider immediately if you notice any of these symptoms.
- **DPD Gene Mutation:** There is a very rare genetic mutation in the DPD gene that can cause very serious side effects to this medication. Report any worsening or unusual symptoms to your healthcare

team immediately.

Sexual & Reproductive Concerns

This medication may affect your reproductive system, resulting in the menstrual cycle or sperm production becoming irregular or stopping permanently. Women may experience menopausal effects including hot flashes and [vaginal dryness](#). In addition, the desire for sex may decrease during treatment. You may want to consider sperm banking or egg harvesting if you may wish to have a child in the future. Discuss these options with your oncology team.

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. Effective birth control is necessary during treatment and for at least 3 months after treatment, even if your menstrual cycle stops or you believe you are not producing sperm. You should not breastfeed while receiving this medication.

Irinotecan (Camptosar®, CPT-11)

Content Contributor: Christina Bach, MBE, LCSW, OSW-C, FAOSW

Pronounce: EYE-ri-noe-TEE-kan

Classification: Topoisomerase inhibitor

About Irinotecan (Camptosar®, CPT-11)

Irinotecan is thought to work by blocking the action of an enzyme in cells called topoisomerase I. Cells need this enzyme to keep their DNA in the proper shape when they are dividing. Blocking this enzyme leads to breaks in the DNA, which leads to cell death.

How to Take Irinotecan

Irinotecan is given by intravenous (IV, into a vein) infusion. It is used in a variety of chemotherapy regimens. The actual dose and dosing schedule will depend on your treatment regimen, body size, and general health. You may receive anti-nausea medication and anti-diarrheal medication like atropine prior to the irinotecan infusion.

Even when carefully and correctly administered by trained personnel, this drug may cause a feeling of burning and pain. There is a risk that this medication may leak out of the vein at the injection site, resulting in tissue damage that can be severe. If the area of injection becomes red, swollen, or painful at anytime during or after the injection, notify your care team immediately. Do not apply anything to the site unless instructed by your care team.

The blood levels of this medication can be affected by certain foods and medications, so they should be avoided for 1-2 weeks before treatment. These include: grapefruit, grapefruit juice, carbamazepine, ketoconazole, rifampin, phenytoin, phenobarbital, and St. John's wort, among others. Be sure to tell your healthcare provider about all medications and supplements you take.

Possible Side Effects of Irinotecan

There are a number of things you can do to manage the side effects of irinotecan. Talk to your care team about these recommendations. They can help you decide what will work best for you. These are some of the most common or important side effects:

Diarrhea

Diarrhea is a common side effect of irinotecan and can be very dangerous because it can lead to serious dehydration. Diarrhea can be defined as an increase in the number of bowel movements you have in a day.

Your healthcare team may administer a medication in the clinic if you develop diarrhea right away. Your healthcare provider will tell you how to take loperamide (an anti-diarrheal medication) at home, which you should start taking as soon as diarrhea develops. Diarrhea is a serious side effect that can lead to dehydration. Notify your healthcare team if diarrhea does not stop on this medication so they can help you better manage this side effect.

Runny nose, excess saliva, watery eyes, sweating and cramping can accompany diarrhea that occurs within the first day of receiving this medication. If any of these symptoms occur during the infusion, notify your nurse. Diarrhea can continue to occur for 10-12 days after the treatment. Diarrhea can be a serious side effect that can lead to dehydration. Notify your healthcare provider if you develop diarrhea.

Low White Blood Cell Count (Leukopenia or Neutropenia)

White blood cells (WBC) are important for fighting infection. While receiving treatment, your [WBC count can drop](#), putting you at a higher risk of getting an infection. You should let your doctor or nurse know right away if you have a fever (temperature greater than 100.4°F/38°C), sore throat or cold, shortness of breath, cough, burning with urination, or a sore that doesn't heal.

Tips to preventing infection:

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- When working in your yard, wear protective clothing including long pants and gloves.
- Do not handle pet waste.
- Keep all cuts or scratches clean.
- Shower or bath daily and perform frequent [mouth care](#).
- Do not cut cuticles or ingrown nails. You may wear nail polish, but not fake nails.
- Ask your oncology care team before scheduling dental appointments or procedures.
- Ask your oncology care team before you, or someone you live with, has any vaccinations.

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Low Platelet Count (Thrombocytopenia)

Platelets help your blood clot, so when the [count is low](#) you are at a higher risk of bleeding. Let your oncology care team know if you have any excess bruising or bleeding, including nose bleeds, bleeding gums, or blood in your urine or stool. If the platelet count becomes too low, you may receive a transfusion of platelets.

- Do not use a razor (an electric razor is fine).
- Avoid contact sports and activities that can result in injury or bleeding.
- Do not take aspirin (salicylic acid), non-steroidal anti-inflammatory medications (NSAIDs) such as Motrin/Advil (ibuprofen), Aleve (naproxen), Celebrex (celecoxib), etc., as these can all increase the risk of bleeding. Please consult with your healthcare team regarding the use of these agents and all over-the-counter medications/supplements while on therapy.
- Do not floss or use toothpicks, and use a soft-bristle toothbrush to brush your teeth.

Nausea and/or Vomiting

Talk to your oncology care team so they can prescribe medications to help you manage [nausea and vomiting](#). In addition, dietary changes may help. Avoid things that may worsen the symptoms, such as heavy or greasy/fatty, spicy, or acidic foods (lemons, tomatoes, oranges). Try saltines or ginger ale to lessen symptoms.

Call your oncology care team if you are unable to keep fluids down for more than 12 hours or if you feel lightheaded or dizzy at any time.

Fatigue

[Fatigue](#) is very common during cancer treatment and is an overwhelming feeling of exhaustion that is not usually relieved by rest. While on cancer treatment, and for a period after, you may need to adjust your schedule to manage fatigue. Plan times to rest during the day and conserve energy for more important activities. Exercise can help combat fatigue; a simple daily walk with a friend can help. Talk to your healthcare team for helpful tips on dealing with this side effect.

Loss or Thinning of Scalp and Body Hair (Alopecia)

Your hair may become [thin, brittle, or fall out](#). This typically begins two to three weeks after treatment starts. This hair loss can be all body hair, including pubic, underarm, legs/arms, eyelashes, and nose hairs. The use of scarves, wigs, hats, and hairpieces may help. Hair generally starts to regrow soon after treatment is completed. Remember your hair helps keep you warm in cold weather, so a hat is particularly important in cold weather or to protect you from the sun.

Decrease in Appetite or Taste Changes

[Nutrition](#) is an important part of your care. Cancer treatment can affect your appetite and, in some cases, the side effects of treatment can make eating difficult. Ask your oncology care team about nutritional counseling services at your treatment center to help with food choices.

- Try to eat five or six small meals or snacks throughout the day, instead of 3 larger meals.
- If you are not eating enough, nutritional supplements may help.
- You may experience a metallic taste or find that food has no taste at all. You may dislike foods or beverages that you liked before receiving cancer treatment. These symptoms can last for several months or longer after treatment ends.
- Avoid any food that you think smells or tastes bad. If red meat is a problem, eat chicken, turkey, eggs, dairy products, and fish without a strong smell. Sometimes cold food has less of an odor.
- Add extra flavor to meat or fish by marinating it in sweet juices, sweet and sour sauce or dressings. Use seasonings like basil, oregano, or rosemary to add flavor. Bacon, ham, and onion can add flavor to vegetables.

Important but Less Common Side Effects

- **Lung Changes:** This medication may cause interstitial lung disease, which is a scarring and stiffening of the lung tissue. Call your healthcare provider right away if you have new or worsening shortness of breath, cough, wheezing, or difficulty breathing.
- **Kidney Problems:** This medication can cause kidney problems, usually secondary to dehydration as a result of diarrhea or vomiting. Your creatinine level may be increased, which your oncology care team may monitor using blood tests. Notify your healthcare provider if you notice decreased urine output, blood in the urine, swelling in the ankles, or loss of appetite.
- **Allergic Reactions:** In some cases, patients can have an allergic reaction to this medication. Signs of a reaction can include: shortness of breath or difficulty breathing, chest pain, rash, flushing or itching, or a decrease in blood pressure. If you notice any changes in how you feel during the infusion, let your nurse know immediately. The infusion will be slowed or stopped if this occurs.

Reproductive Concerns

Exposure of an unborn child to this medication could cause birth defects, so you should not become pregnant or father a child while on this medication. Effective birth control is necessary during treatment and for 6 months after treatment has ended for women and 3 months after treatment has ended for men. Even if your menstrual cycle stops or you believe you are not producing sperm, you could still be fertile and conceive. You should not breastfeed while receiving this medication or for one week after your last dose.

Leucovorin (Calcium Leucovorin, Citrovorum Factor, Folinic Acid)

Content Contributor: Christina Bach, MBE, LCSW, OSW-C, FAOSW

Pronounce: loo-koe-VOR-in

Classification: Folic Acid Analog

About Leucovorin (Calcium Leucovorin, Citrovorum Factor, Folinic Acid)

Leucovorin is not a chemotherapy medication. It is given with chemotherapy. Leucovorin can be used with the chemotherapy medication [fluorouracil \(5-FU\)](#). In this case, it is used to enhance the effects of the fluorouracil, in other words, to make the drug work better. Leucovorin is also given with a chemotherapy agent called [methotrexate](#), but in this case, it is given to "rescue" normal, healthy cells from the damage caused by the methotrexate. In order to give the methotrexate time to kill the cancer cells, leucovorin is started 12-24 hours after the methotrexate is given.

How to Take Leucovorin

This medication can be given in an intravenous (IV) or oral form (by mouth). The dosage is based on the particular protocol being used by the doctor. You should not take supplemental folic acid while receiving leucovorin, as this may enhance the effect to an undesirable degree.

If you are taking the oral form of leucovorin, it is important to make sure you are taking the correct amount of medication every time. Before every dose, check that what you are taking matches what you have been prescribed.

Storage and Handling

Store the oral form of this medication at room temperature in the original container. If you prefer to use a pillbox, discuss this with your oncology pharmacist. Ask your oncology team where to return any unused medication for disposal. Do not flush down the toilet or throw in the trash.

Where do I get this medication?

The oral formulation of this medication is available through a retail or mail-order pharmacy. Your oncology team will work with your prescription drug plan to identify an in-network pharmacy for medication distribution.

Insurance Information

This medication may be covered under your prescription drug plan. Co-pay assistance from private third-party foundations may be available. Your care team can help you access these resources if they are available.

Possible Side Effects of Leucovorin

Leucovorin rarely has side effects. Any side effects experienced are generally associated with the chemotherapy that is given with the leucovorin, rather than the leucovorin itself. In the case of [fluorouracil](#),

leucovorin may make the side effects of that medication worse. When used with [methotrexate](#), it helps to lessen the severity of side effects. In rare cases, rash, hives, itching, and wheezing have been reported with leucovorin.

OncoLink is designed for educational purposes only and is not engaged in rendering medical advice or professional services. The information provided through OncoLink should not be used for diagnosing or treating a health problem or a disease. It is not a substitute for professional care. If you have or suspect you may have a health problem or have questions or concerns about the medication that you have been prescribed, you should consult your health care provider.